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ABSTRACT

A child's neuropsychological assessment entails the examination of the neurological integrity and functioning of a child's brain and the child's concommitant behavioral responses. This paper reviews the use of two major assessment batteries: (1) the Halstead-Reitan Neuropsychological Tests that measure basic sensory and motor functioning as well as specific higher cortical skills, and (2) the Luria-Nebraska Neuropsychological Battery-Children's Revision, which is based on a neurodevelopmental perspective in regard to cortical functioning, Recognizing that the difficulty lies in finding a screening device that is designed to monitor developmental progress yet is capable of identifying at risk children, the paper argues for a neurodevelopmental screening approach that examines maturational developments as well as the functional integrity of the sensory and motor areas and would evaluate such areas as fine and gross motor development, the basic sensory integrity of the visual, auditory, and tactile modalities, and language. The paper concludes by suggesting that the combination of the neurodevelopmental checklist and the neuropsychological assessment approach provides for a useful and needed early detection system for preschool children. (HOD)

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Neuropsychological Assessment and Neurodevelopmental Screening: A Role in Preschool Programs

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Abstract

The present article examines the use of neuropsychological testing in the formal assessment of preschool children. Two major assessment batteries are reviewed and a brief summary of neuropsychological development is presented. Also discussed is the relevance of a neurodevelopmental checklist serving as an informal screening device to identify at risk children. The checklist, which is based on normal neurobehavioral development, is designed to provide a quick but comprehensive assessment of a child in the classroom setting. Areas that are evaluated in the checklist include fine and gross motor development, basic sensory integrity of the visual, auditory, and tactile modalities, and language. The combination of the neurodevelopmental checklist and the neuropsychological assessment approach provides for a useful and needed early detection system for preschool children.

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Neuropsychological Assessment and Neurodevelopmental Screening:

A Role in Preschool Programs

Child neuropsychological assessment entails the examination of the neurological integrity and functioning of a child's brain and the child's concomitant behavioral responses. This is accomplished through the use of a standard battery or a set of individual tests designed to measure specific brain-behavior relationships. Clinical data generated from the neuropsychological assessment are utilized in both the diagnosis of and intervention with children with brain dysfunction.

Considerable evidence has been collected that attests to the usefulness of neuropsychological testing in the clinical setting. In fact, the clinical benefits of the neuropsychological approach have contributed to its usage beyond the clinical and hospital setting. It is becoming apparent that educational instruction and programs in the schools can be enhanced by this assessment process (Gaddes 1981; Rourke & Gates 1981; Hartlage & Reynolds 1981). Neuropsychological assessment has also improved our understanding of learning styles, academic readiness, and developmental delays (Hartlage & Telzrow 1983). The neuropsychological approach enables professional educators to better understand the cognitive process and the neurological base underlying it. Through the use of the neuropsychological assessment cognitive strengths and weaknesses are identified, remedial needs and capacities

are determined, and appropriate interventions can be pursued and periodically reexamined. The major intent of the assessment is to determine accurately if a child's brain is working properly and if not, where the damage or dysfunction might be located and what can be done to remediate or counteract the problem.

Historically, clinical neuropsychology has primarily examined cortical dysfunction in adults (Luria 1966). Nevertheless, child neuropsychology possesses an ever expanding research base and a comprehensive assessment approach (Gaddes 1985; Rourke 1985; Rourke et al., 1983). A neuropsychological assessment typically involves the use of a testing battery which is a collection of individual tests designed to measure particular cortical functions and skills. In a standard neuropsychological battery basic sensory modalities are evaluated including the visual, auditory, and tactile senses, and basic motor functions. In addition, auditory rhythm, receptive and expressive language, tactile-spatial integration, memory, math, visual-perceptual organization, verbal learning, and concept formation skills are examined.

Two major assessment batteries have emerged in identifying neuropsychological dysfunction in children: the Halstead-Reitan and Luria batteries. Two separate versions of the Halstead-Reitan are utilizied in testing. The Halstead Neuropsychological Test Battery for Children is used with children from nine to fourteen years of age. The Reitan-Indiana Neuropsychological Test Battery is designed for younger children, ages five through eight. The Halstead-Reitan batteries are

both collections of tests extended down from the adult battery that collectively function as an indicator of brain dysfunction in children (Boll 1974; Reitan 1974). Basic sensory and motor functioning as well as specific higher cortical skills including verbal processing and memory, auditory rhythm, visual-spatial functioning, and higher mental processing are examined in the Halstead-Reitan battery. Intelligence testing involving the Wechsler Intelligence Scales is also included in the batteries because valuable clinical information on verbal learning and visual-spatial capabilities can be obtained from the test results.

The Luria-Nebraska Neuropsychological Battery-Children's Revision is designed for children ages 8-12 and the battery is based on a neurodevelopmental perspective in regard to cortical functioning (Plaisted et al., 1983). A qualitative outlook on neurological development of the brain is emphasized in this approach. This theoretical perspective contends that within the neural growth pattern specific systems develop at different times and more specialized skills build upon less specialized or more basic skills; consequently certain skills do not emerge unless the necessary cortical growth and maturation exists. The Luria battery is designed to reflect this hierarchical nature of neurodevelopment. Though this battery examines cortical skills as does the Halstead-Reitan, it is designed to correspond with and measure the developing functional systems of the brain. By contrast, the major clincial emphasis behind the Halstead-Reitan is to accurately differentiate brain-damaged from normal children. The intent

of the battery is to identify brain dysfunction, not to investigate in detail what cortical or functional systems are impaired and the extent of the damage on those systems. The utility of the Halstead-Reitan battery comes from its specially selected subtests and standardized format that allows clinical interpretation based on test data.

For the reader, Golden (1981) provides a concise explanation of Luria's theory and of neuropsychological development in general. Unfortunately this paper can only provide a very brief explanation of cortical zone development and its hierarchical structure. Luria's approach to neuropsychological development involves a qualitative outlook on cortical growth consisting of three levels or zones of cortical functioning (Luria 1973). The primary zones in the brain directly receive information from the sense modalities i. e. visual, auditory, tactile, or send impulses as in the motor strip of the frontal lobe. Cortical information is then processed and interpreted in the secondary cortical zones. The tertiary zones of the brain are responsible for the higher integration and synthesis of cortical information. Since these areas overlap across cortical regions or lobes, cortical information from the secondary zones is collected and integrated there. Therefore, advanced cortical functioning is always dependent on the lower functioning zones. Environmental stimulation and experience are also necessary and work in combination with the neurological base before a certain skill or behavior will develop and exist. The growth of the cortical zones can be described in a five stage process (Golden 1981). However, specific definitive ages cannot be attached to these stages since

individual growth rates, stimulation, and nutrition factors will vary with each child. In addition, factors involved in the physical development of the brain i.e. myelinization, development of neuronal pathways, branching of brain cells, etc., will also differ from child to child. Despite the individual variation in cortical growth, stages 1 and 2 can be expected to function at birth or soon afterwards and continue to develop through the first year. Stage 3 growth is dependent on earlier development and will continue up into the preschool years. Stage 4 growth begins to emerge at the four to five year range and continues well into the school-age years. Finally, the cortical development necessary for stage 5 occurs during adolescence and into young adulthood. From Luria's work, Golden (1981) has provided a clear description of the normal progression in neuropsychological development. The first stage involves subcortical development in particular the arousal unit of the brain or the reticular activiting system (RAS) which is located in the brainstem. The purpose of the RAS is to maintain cortical tone or attention. The remaining stages of cortical development involve the motor and sensory areas of the cerebral cortex. In stage 2 critical neurodevelopment occurs in the primary sensory and motor areas involving the reception and utilization of sensory information through the visual, auditory, and somesthetic sense modalities and the replacement of reflexive behaviors with learned motor skills. Stage 3 builds upon stage 1 and 2 development in that attentional focus improves and the sensory processing systems become further refined in the secondary cortical zones. Learning occurs

within but not yet across sensory modalities in stage 3. Integration and synthesis of information are characteristic of stage 4 development and the regions that show particular growth at this time are the tertiary regions of the parietal lobes. In these areas cortical information from the various sense modalities is synthesized; consequently, complex cognitive activities like reading and math computation are integrated in the tertiary zones of the parietal-temporal-occipital regions. Stage 5 development involves the prefrontal areas and is considered a neural advancement of adolescence and young adulthood. In summary, qualitative changes and shifts occur in the cortical growth process and neuropsychological test batteries are designed to evaluate the integrity of those functional systems.

Most research in the area of assessment and the formulation of test batteries has been directed toward school-aged children rather then the preschool population. Consequently, no standardized neuropsychological test batteries currently exist for children younger than five years of age. At present, neuropsychologists must utilize various individual tests collectively in a mini-battery format (Hartlage & Telzrow 1983). A mini-battery involves the use of specific standardized tests to assess various cognitive functions at different age levels with the focus on collecting test data on specific cortical functions from individual tests that measure those functions. For instance, a possible battery might include specific tests to measure receptive language, visual-motor integration, and memory. Despite the lack of standardized batteries, as the research in this area develops and expands so will the

construction and implementation of batteries and assessment techniques for preschool children.

Child neuropsychology has grown and developed into a major clinical specialty of psychology. The neuropsychological approach has met with tremendous professional acceptance. Several factors are responsible for this including assessment advancements and refinements, clinical benefits from the assessment, and the therapeutic interventions that are generated and utilized from the assessment in the treatment. This approach employs sound psychometric tests and procedures that provide for valid and reliable clinical results, enabling the neuropsychologist to recommend appropriate interventions for treatment. The recognition of this assessment approach has coincided with the growth and interest in early assessment and intervention procedures in preschool programs. In fact, the current emphasis on early diagnosis and intervention in developmental problems, that can evolve into future academic problems, has prompted many early childhood educators to integrate formal assessment procedures into the preschool curriculum (Bagnato & Neisworth 1981). Yet few early childhood programs have the resources or the personnel to construct and maintain a unified formal evaluation system. Most programs focus their attention on instruction and curriculum matters and the assessment component takes a back seat to other needs. However, parents have become increasingly aware of and interested in their childrens' early development and progress and the subsequent periodic assessment of that progress. As a result of this academic accountability, numerous tests and assessment packages have

been developed and marketed in order to help early childhood educators better document developmental and educational progress. Some packages even purport to have diagnostic capabilities. Whether these packages have the capabilities they say they do is not an issue this paper will examine. The question of who should perform a formal assessment will be examined as it relates to the entire assessment process.

The fundamental issue in assessment is not the selection of one particular program or approach because all of them share the fundamental premise of early detection of and intervention with learning problems. In regard to early detection, many early childhood programs follow a two stage process: 1) a general screening procedure and 2) a formal assessment procedure that closely examines the at risk children identified in the screening. Clearly, the major issue in assessment is that teachers often have neither the time nor perhaps the testing background and expertise that is needed to conduct formal assessments. Subjective bias, personal involvement that can influence the testing, along with other extraneous factors would interfere with and contaminate any formal assessment. In addition, the responsibility for formal assessment should not be placed on teachers but borne by outside sources such as a trained professional examiner who is part of the preschool program, or an independent examiner who has been hired for this service. The clinical benefits from a neuropsychological assessment support its selection and use as a formal evaluation procedure for preschool programs. This approach would be invaluable in helping to identify and evaluate a child's problem area and its current and future impact,

pinpoint developmental/academic strengths and weaknesses, and individualize remediation and treatment.

Formal assessment is an important part of the assessment process although the testing emphasis for early childhood programs should be on screening so that at risk children can be identified and then fully examined in a formal assessment. Formal testing and evaluation is the second stage of the assessment process and a valid screening procedure to identify children with potential problems must be in place first if the entire process is to work.

The difficulty lies in finding a screening device that is designed to monitor developmental progress yet is capable of identifying at risk children. This screening must also be economical, allow for easy administration, and be relatively quick in order minimize loss of class time. A neurodevelopmental screening approach that examines maturational developments as well as the functional integrity of the sensory and motor areas could help examine and document neurobehavioral progress; while identifying sensory or motor difficulties that could develop into future learning problems. Research has indicated that many children who demonstrate difficulty in school have histories of sensory problems such as otitis media or ocular system problems (Freeman & Parkins 1979; Reichman & Healey 1983; Solan 1981; Getman 1981). The visual and auditory channels are particularly important in early development since both modalities are necessary in the acquisition and development of language and reading skills. Therefore, a screening approach that examines developmental progress but provides

additional information on sensory functioning could serve as the first level of assessment in any preschool program. Presently, this author is collecting norming data on a neurodevelopmental checklist that could be used as an informal screening device for preschool children. This checklist examines both fine and gross motor development as well as the reception and processing integrity of the visual, auditory, and tactile modalities. A language section is also included in the checklist. In this section language skills are examined including receptive and expressive language, basic vocabulary and word knowledge, and general comprehension. Items are arranged, within the motor, sensory, and language areas, in a hierarchical fashion with a developmental age or range associated with each item. A rating scale (0-present, 1-mild difficulty, 2-moderate difficulty, 3-absent) is used and the teacher starts with an appropriate item depending on the age of the child. The teacher then proceeds through the various items and rates the child's performance. If a child fails age appropriate items, the testing back to earlier items would be necessary so that a basal level is established. By way of this process the teacher can identify the functioning level of the child within the area or areas being examined. This rating provides an estimate of a child's sensory integrity and developmental level. If a child is functioning significantly below his age range i.e. 9 months to 1 year below chronological age in one or more areas, then a more detailed assessment would be in order. This approach provides a quick but comprehensive screening that can be easily administered by a teacher or work aide in

the classroom. Because most of the test items are or could be routinely performed as part of classroom activities, this approach could be easily assimilated into the curriculum. Certainly combining the assessment program into the basic classroom curriculum provides for a much stronger and more unified pedagogical system.

This neurodevelopmental checklist examines the normal neuro-behavioral changes that occur from birth or soon after to approximately the age of six; with particular emphasis on motor, sensory, and language development. It is hoped that this checklist can provide early childhood educators with a quick and systematic procedure for documenting neurological progress as well as identifying sensory or motor dysfunction. If checklists like the one described in this paper are not available or readily accessible, the teacher can still collect clinical data on children that they suspect have neurologically related problems. Usually a child's gross motor performance can be examined and evaluated during play or other physical activities. If balance, gait, or coordination problems are noticed, especially if these conditions are extreme compared to the child's peer group, then further testing may be necessary. Assessment of fine motor functioning can be examined through a number of tasks including cutting, drawing, writing, and block building. In regard to visual and auditory functioning, any unusual behavior or behavior pattern should be recorded and followed up, particularly if it is a recurring phenomenon. Sensory difficulties such as an inability to focus or track, abnormal eye movements, consistent ear infections, and unresponsiveness to verbal commands could

be indicators or more serious problems. In addition, an invaluable source of information for teachers is the child's medical record and history. If available, this source should always be tapped since the medical history often provides a good picture of the child's neuro-development prior to school. Through observations, informal testing, and classwork, teachers can accumulate valuable information on a child; information that may suggest a more formal assessment is needed. The results of a formal assessment can often change the educational outcome for a child and teachers play a major role in whether an evaluation reaches that formal level.

A screening approach that examines normal development as well as identifies at risk children is a necessity for preschool programs. Preschool programs have a professional obligation to provide the best possible service and assessment must be considered as part of that service. The general public has come to expect testing and periodic assessment of their childrens' progress, even at the preschool level. Regardless of the particular assessment approach that is selected, early childhood educators must realize the evaluation of the developmental process is as essential as the curriculum that is taught. Moreover, the sooner a child's learning problem is detected, providing he or she has one, the greater his or her chances are of adapting and benefiting from the classroom experience.

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